WHAT IS CLAIMED IS:

1. An oscillation circuit comprising:

an inverting amplifier including a first semiconductor switching element and a second semiconductor switching element;

wherein said first and second semiconductor switching elements are prevented from being on simultaneously to limit a short-circuiting current flowing through said inverting amplifier when said oscillation circuit is driven, and

wherein a sum of an absolute value of a threshold voltage of said first semiconductor switching element and an absolute value of a threshold voltage of said second semiconductor switching element is set to be greater than or equal to an absolute value of a power voltage of said inverting amplifier, to limit a short-circuiting current flowing through said inverting amplifier.

2. The oscillation circuit as defined in claim 1,

further comprising a feedback circuit having a crystal oscillator connected between an output side and an input side of said inverting amplifier, for causing a phase of an output signal from said inverting amplifier to invert and feeding the inverted signal back to said inverting amplifier as an input;

wherein said inverting amplifier comprises a first

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circuit including said first semiconductor switching element, and a second circuit including said second semiconductor switching element;

wherein said first semiconductor switching element is connected to a side of a first potential and is driven to be turned on and off by said feedback input, to excite said crystal oscillator;

wherein said second semiconductor switching element is connected to a side of a second potential that differs from said first potential and is driven to be turned on and off by said feedback input at a timing that differs from that of said first semiconductor switching element, to excite said crystal oscillator.

3. The oscillation circuit as defined in claim 1 wherein an OFF region in which said first and second semiconductor switching elements are turned off so that they are prevented from being on simultaneously includes a sub-threshold region in which a sub-threshold current flows.

4. The oscillation circuit as defined in claim 1 wherein the sum of the absolute values of the threshold voltages of said first and second semiconductor switching elements is set to be greater than or equal to the absolute value of the power voltage of said inverting amplifier to satisfy the following formula

$$|V_{reg}| \leqq |V1| + |V2|$$

where the absolute value of the threshold voltage of said

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first semiconductor switching element is $|V1|$; the absolute value of the threshold voltage of said second semiconductor switching element is $|V2|$; and the absolute value of the power voltage of the inverting amplifier is $|V_{reg}|$, and

wherein the absolute values of the threshold voltages of said first and second semiconductor switching elements are set to be smaller than the absolute value of the power voltage of said inverting amplifier as represented by the following formulae

$|V_{reg}| > |V1|$ and

$|V_{reg}| > |V2|$.

5. The oscillation circuit as defined in claim 1, further comprising a source of constant current being connected in parallel to at least one of said first and second semiconductor switching elements, wherein a shortage of power necessary for stabilizing oscillation is offset by power from said source.

6. The oscillation circuit as defined in claim 5 wherein the absolute value of the power voltage of the inverting amplifier is set to be equal to a minimum value of power necessary for stabilizing oscillation.

7. The oscillation circuit as defined in claim 1, further comprising ~~a plurality of~~ constant current sources connected in parallel with at least one of said first and second semiconductor switching elements, each constant

current source supplying a different constant current, and a selection circuit for selecting a constant current source from said [~~plurality of~~] constant current sources, wherein a shortage of power necessary for stabilizing oscillation is offset by power from said selected source.

8. The oscillation circuit as defined in claim 7 wherein the absolute value of the power voltage of the inverting amplifier is set to be equal to a minimum value of power necessary for stabilizing oscillation.

9. The oscillation circuit as defined in claim 7 wherein a target absolute value of the power voltage of said inverting amplifier is set to be between an absolute value of a minimum power voltage of said inverting amplifier necessary for stabilizing oscillation and an absolute value of a first power voltage that is smaller than the absolute value of said minimum power voltage by a range of fluctuations of power voltages of inverting amplifiers in oscillation circuits which are produced in large quantities and wherein said selection circuit selects a constant current based on power voltages of inverting amplifiers in oscillation circuits which are produced in large quantities, and a shortage of power necessary for stabilizing oscillation is offset by power from said selected source.

10. The oscillation circuit as defined in claim 7 wherein said constant current sources comprise a plurality of

constant current sources connected in parallel to said first semiconductor switching element, each of said plurality of constant current sources supplying a different constant current and another plurality of constant current sources connected in parallel to said second semiconductor switching element, each of said another plurality of constant current sources supplying a different constant current and wherein said selection circuit selects a constant current source from said pluralities of constant current sources, and a shortage of power necessary for stabilizing oscillation is offset by power from said selected source.

11. The oscillation circuit as defined in claim 1, further comprising a power supply circuit for selectively outputting at least two types of power voltages V_{reg}, one having a large absolute value for initiating oscillation and the other having a small absolute value for stabilizing oscillation and wherein the power voltage having said large absolute value for initiating oscillation is supplied to said inverting amplifier during a period of time between turning power on and stabilizing oscillation while the other power voltage having said small absolute value for stabilizing oscillation is supplied to said inverting amplifier during a period of time between stabilizing oscillation and terminating oscillation.

12. The oscillation circuit as defined in claim 11, further

comprising a voltage control circuit for controlling said power supply circuit to output the power voltage having the large absolute value for initiating oscillation when a period of time between turning power on and stabilizing oscillation is detected, for controlling said power supply circuit to output the other power voltage having the small absolute value for stabilizing oscillation when a transition from turning power on to stabilizing oscillation is detected.

13. The oscillation circuit as defined in claim 12 wherein said voltage control circuit comprises a power-on detecting circuit for detecting a power on of said oscillation circuit and a timer for detecting a transition from turning power on to stabilizing oscillation by measuring time passed since power is turned on, for controlling said power supply circuit to output the power voltage having the large absolute value for initiating oscillation at a time said power is turned on and for controlling said power supply circuit to output the other power voltage having the small absolute value for stabilizing oscillation when said timer detects a transition from turning power on to stabilizing oscillation.

14. The oscillation circuit as defined in claim 1 wherein said inverting amplifier comprises a first inverting amplifier for initiating oscillation and a second inverting amplifier for stabilizing oscillation and wherein said

first inverting amplifier provides oscillation during a period of time between turning power on and stabilizing oscillation while said second inverting amplifier provides oscillation during a period of time between stabilizing oscillation and terminating oscillation.

15. The oscillation circuit as defined in claim 14, further comprising an inverting-amplifier switching circuit for selecting said first inverting amplifier when a period of time between turning power on and stabilizing oscillation is detected and for selecting said second inverting amplifier after a transition from turning power on to stabilizing oscillation.

16. The oscillation circuit as defined in claim 15 wherein said inverting-amplifier switching circuit comprises a power-on detecting circuit for detecting a power on of said oscillation circuit and a timer for detecting a transition from turning power on to stabilizing oscillation by measuring time passed since power is turned on and wherein said first inverting amplifier is selected at a time power is turned on while said second inverting amplifier is selected when said timer detects a transition from turning power on to stabilizing oscillation.

17. The oscillation circuit as defined in claim 14 wherein an absolute value of a threshold voltage of a semiconductor switching element that constitutes said first inverting

amplifier is set to be smaller than an absolute value of a threshold voltage of a semiconductor switching element that constitutes said second inverting amplifier.

18. The oscillation circuit as defined in claim 1 wherein said oscillation circuit uses a crystal oscillator having a high value of Q, the value Q being an index representing a degree of easiness in mechanical oscillation.

19. The oscillation circuit as defined in claim 18 wherein said value Q is equal to or higher than 10,000 and is represented by the following

$$Q = \alpha / Rxt$$

where Rxt is a component of resistance in the crystal oscillator and α is a coefficient.

20. An oscillation circuit comprising:

an inverting amplifier including a first semiconductor switching element and a second semiconductor switching element, said first and second semiconductor switching elements being prevented from being on simultaneously to limit a short-circuiting current flowing through said inverting amplifier when said oscillation circuit is driven; and

a bias circuit for applying a first direct current bias voltage and a second direct current bias voltage to gates of said first semiconductor switching element and said second semiconductor switching element, respectively;

said first and second direct current bias voltages shifting values of the direct current potentials of feedback inputs that are input from said inverting amplifier to said gates of said first and second semiconductor switching elements, to prevent said first and second semiconductor switching elements from being on simultaneously.

21. An oscillation circuit comprising:

an inverting amplifier including a first semiconductor switching element and a second semiconductor switching element, said first and second semiconductor switching elements being prevented from being on simultaneously to limit a short-circuiting current flowing through said inverting amplifier when said oscillation circuit is driven;

a feedback circuit having a crystal oscillator connected between an output side and an input side of said inverting amplifier, for causing a phase of an output signal from said inverting amplifier to invert and feeding the inverted signal back to said inverting amplifier as an input; and

a bias circuit for applying a direct current bias voltage to said inverting amplifier;

wherein said inverting amplifier comprises:

a first circuit being connected to a side of a first potential and including said first semiconductor switching element; and

a second circuit being connected to a side of a second potential that differs from said first potential and including said second semiconductor switching element;

wherein said first semiconductor switching element is connected to a side of said first potential and is driven to be turned on and off by said feedback input that is input to a gate, to excite said crystal oscillator;

wherein said second semiconductor switching element is connected to a side of said second potential and is driven to be turned on and off by said feedback input that is input to a gate at a timing that differs from that of said first semiconductor switching element, to excite said crystal oscillator;

wherein said bias circuit comprises:

a first bias circuit for applying a first direct current bias voltage to a gate of said first semiconductor switching element; and

a second bias circuit for applying a second direct current bias voltage to a gate of said second semiconductor switching element; and

wherein said first and second direct current bias voltages shift values of the direct current potentials of feedback inputs that are input from said inverting amplifier to said gates of said first and second semiconductor switching elements, to prevent said first and second semiconductor switching elements from being on simultaneously.

22. The oscillation circuit as defined in claim 21 wherein said first direct current bias voltage is set to said first potential and wherein said second direct current bias voltage is set to said second potential.

23. The oscillation circuit as defined in claim 1 wherein said first and second semiconductor switching elements are configured by using field-effect transistor elements of differing conductivity types.

24. The oscillation circuit as defined in claim 20 wherein an OFF region in which said first and second semiconductor switching elements are turned off so that they are prevented from being on simultaneously includes a sub-threshold region in which a sub-threshold current flows.

25. The oscillation circuit as defined in claim 20 wherein said first and second semiconductor switching elements are configured by using field-effect transistor elements of differing conductivity types.

26. The oscillation circuit as defined in claim 20, further comprising a source of constant current being connected in parallel to at least one of said first and second semiconductor switching elements, wherein a shortage of power necessary for stabilizing oscillation is offset by power from said source.

27. The oscillation circuit as defined in claim 26 wherein an absolute value of a power voltage of the inverting amplifier is set to be equal to a minimum value of power necessary for stabilizing oscillation.

28. The oscillation circuit as defined in claim 20 further comprising ~~a plurality of~~ constant current sources being connected in parallel to at least one of said first and second semiconductor switching elements, each constant current source supplying a different constant current, and a selection circuit for selecting a constant current source from said plurality of constant current sources, wherein a shortage of power necessary for stabilizing oscillation is offset by power from said selected source.

29. The oscillation circuit as defined in claim 28 wherein an absolute value of a power voltage of the inverting amplifier is set to be equal to a minimum value of power necessary for stabilizing oscillation.

30. The oscillation circuit as defined in claim 28 wherein an absolute value of a target power voltage of said inverting amplifier is set to be between an absolute value of a minimum power voltage of said inverting amplifier necessary for stabilizing oscillation and an absolute value of a first power voltage that is smaller than the absolute value of said minimum power voltage by a range of fluctuations of power voltages of inverting amplifiers in oscillation

circuits which are produced in large quantities and wherein said selection circuit selects a constant current based on power voltages of inverting amplifiers in oscillation circuits which are produced in large quantities, and a shortage of power necessary for stabilizing oscillation is offset by power from said selected source.

31. The oscillation circuit as defined in claim 28 wherein said constant current sources comprise a plurality of constant current sources connected in parallel to said first semiconductor switching element, each of said plurality of constant current sources supplying a different constant current and another plurality of constant current sources connected in parallel to said second semiconductor switching element, each of said another plurality of constant current sources supplying a different constant current and wherein said selection circuit selects a constant current source from said pluralities of constant current sources, and a shortage of power necessary for stabilizing oscillation is offset by power from said selected source.

32. The oscillation circuit as defined in claim 20, further comprising a power supply circuit for outputting at least two types of power voltages V_{reg}, one having a large absolute value for initiating oscillation and the other having a small absolute value for stabilizing oscillation and wherein the power voltage having said large absolute value

for initiating oscillation is supplied to said inverting amplifier during a period of time between turning power on and stabilizing oscillation while the other power voltage having said small absolute value for stabilizing oscillation is supplied to said inverting amplifier during a period of time between stabilizing oscillation and terminating oscillation.

33. The oscillation circuit as defined in claim 32, further comprising a voltage control circuit for controlling said power supply circuit to output the power voltage having the large absolute value for initiating oscillation when a period of time between turning power on and stabilizing oscillation is detected and for controlling said power supply circuit to output the other power voltage having the small absolute value for stabilizing oscillation when a transition from turning power on to stabilizing oscillation is detected.

34. The oscillation circuit as defined in claim 33 wherein said voltage control circuit comprises a power-on detecting circuit for detecting a power on of said oscillation circuit and a timer for detecting a transition from turning power on to stabilizing oscillation by measuring time passed since power is turned on and for controlling said power supply circuit to output the power voltage having the large absolute value for initiating oscillation at a time said power is turned on and for controlling said power supply

circuit to output the other power voltage having the small absolute value for stabilizing oscillation when said timer detects a transition from turning power on to the stabilizing oscillation.

35. The oscillation circuit as defined in claim 20 wherein said inverting amplifier comprises a first inverting amplifier for initiating oscillation and a second inverting amplifier for stabilizing oscillation and wherein said first inverting amplifier provides oscillation during a period of time between turning power on and stabilizing oscillation while said second inverting amplifier provides oscillation during a period of time between stabilizing oscillation and terminating oscillation.

36. The oscillation circuit as defined in claim 35, further comprising an inverting-amplifier switching circuit for selecting said first inverting amplifier when a period of time between turning power on and stabilizing oscillation is detected and for selecting said second inverting amplifier after a transition from turning power on to stabilizing oscillation.

37. The oscillation circuit as defined in claim 36 wherein said inverting-amplifier switching circuit comprises a power-on detecting circuit for detecting a power on of said oscillation circuit and a timer for detecting a transition from turning power on to stabilizing oscillation by

measuring time passed since power is turned on and wherein said first inverting amplifier is selected when said power is turned on while said second inverting amplifier is selected when said timer detects a transition from turning power on to stabilizing oscillation.

38. The oscillation circuit as defined in claim 35 wherein an absolute value of a threshold voltage of a semiconductor switching element that constitutes said first inverting amplifier is set to be smaller than an absolute value of a threshold voltage of a semiconductor switching element that constitutes said second inverting amplifier.

39. The oscillation circuit as defined in claim 20 wherein said oscillation circuit uses a crystal oscillator having a high value of Q, the value Q being an index representing the degree of easiness in mechanical oscillation.

40. The oscillation circuit as defined in claim 39 wherein said value Q is equal to or higher than 10,000 and represented by the following

$$Q = \alpha / Rxt$$

where Rxt is a component of resistance in the crystal oscillator and α is a coefficient.

41. The oscillation circuit as defined in claim 1 wherein a threshold voltage V_T of each of said first and second semiconductor switching elements that functions as a gate

voltage for inverting a conduction type of a silicon crystal surface is represented by the following

$$V_T = 2\phi_E + [2 \cdot \varepsilon_S \cdot q \cdot N_A \cdot (2\phi_E)]^{1/2} / (\varepsilon_S /d)$$

where ϕ_E is a Fermi potential, ε_s is ε Si (a relative dielectric constant of silicon) multiplied by $\varepsilon 0$ (a dielectric constant of vacuum), q is an electron charge, N_A is a concentration of a substrate and d is a thickness of an oxide film.

42. An electronic circuit comprising the oscillation circuit as defined in ~~any one of claims 1, 20 and 21~~ claim 1.

43. A semiconductor device comprising the oscillation circuit as defined in ~~any one of claims 1, 20 and 21~~ claim 1.

44. An electronic equipment comprising the oscillation circuit as defined in ~~any one of claims 1, 20 and 21~~ claim 1.

45. A timepiece comprising the oscillation circuit as defined in ~~any one of claims 1, 20 and 21~~ claim 1.